EXTRACTION OF SQUALENE FROM PALM OIL MESOCARP USING SUPERCRITICAL CARBON DIOXIDE

CHEN XIAO LONG

UNIVERSITI TEKNOLOGI MALAYSIA

EXTRACTION OF SQUALENE FROM PALM OIL MESOCARP USING SUPERCRITICAL CARBON DIOXIDE

CHEN XIAO LONG

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ABSTRACT

An innovative technique of Supercritical Fluid Extraction (SFE) process was adopted for the extraction of squalene from palm oil mesocarp. SFE is the process of separating the extractant from components using supercritical fluids (SCF) with CO_2 as the extracting solvent. However, the use of SFE for industrial application is still unpopular and the references of SFE are serious shortage in present. In this study, there was a comparison experiment between SC-CO_2 extraction and Soxhlet extraction in order to investigate the better method to extract squalene. Meanwhile, for SC-CO_2 extraction, the task was investigated the influence of independent conditions of pressure, temperature and CO_2 flow rate on the extraction of squalene and these independent variables were selected as follows: temperature (45-75 ℃), pressure (16-30 MPa) and CO_2 flow rate (2-5 ml/min). Afterwards, the chemical compositions of palm oil were analyzed by gas chromatography-mass spectrometry (GC-MS). Furthermore, the conditions of SC-CO_2 extraction for squalene were optimized by response surface methodology (RSM) following Box-Behnken Design (BBD) and the result was analyzed by Design Expert software. In the end, the optimum conditions obtained from the investigation were pressure (16 MPa), temperature (45.01 ℃) and CO_2 flow rate (2 ml/min) and the yield of squalene was 0.506%. Besides, after compared the yield of squalene, the method of SC-CO_2 extraction was better than the conventional Soxhlet extraction.

ABSTRAK

Teknik inovasi Pengekstrakan Bendalir Lampau Tinggi (PBLG) telah digunakan untuk menyari squalena daripada sabut minyak sawit. PBLG adalah proses memisahkan bahan larut dari komponen menggunakan bendalir genting lampau dengan karbon dioksida sebagai pelarut. Walau bagaimanapun, penggunaan PBLG di industri masih tidak popular dan kekurangan rujukan PBLG pada masa kini. Dalam kajian ini, perbandingan antara pengekstrakan PBLG dan pengekstrakan Soxhlet akan dibandingkan untuk mencari kaedah terbaik di dalam menghasilkan squalena. Sementara itu, bagi pengekstrakan PBLG pembolehubah pengaruh tekanan, suhu dan kadar aliran karbon dioksida pada pengekstrakan squalene telah dikaji, dan nilai yang dipilih adalah seperti berikut: suhu (45-75 ℃), tekanan (16-30 MPa) dan kadar aliran karbon dioksida (2-5 ml / min). Selepas itu, komposisi kimia minyak sawit telah dianalisis dengan menggunakan gas kromatografi-spektrometri jisim (GK-SJ). Di samping itu, keadaan pengekstrakan SC-CO_2 untuk squalena telah dioptimumkan dengan kaedah Gerak Balas Permukaan (GBP) melalui rekabentuk Box-Behnken (RBB) dan hasilnya dianalisis dengan perisian *Design Expert*. Akhirnya, keadaan optimum diperolehi daripada pengajian ini adalah tekanan (16 MPa), suhu (45.01 ℃) dan kadar aliran karbon dioksida (2 ml/min) dan hasil squalene adalah 0.506%. Selain itu, merujuk kepada hasil squalena, kaedah pengekstrakan PBLG adalah lebih baik daripada pengekstrakan Soxhlet.